

NBSIR 74-514

# 1973 International Activities, Center for Building Technology

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Charles C. Raley  
Coordinator of International Affairs

Center for Building Technology  
Institute for Applied Technology  
National Bureau of Standards  
Washington, D. C. 20234

July 1974

Final



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U. S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS



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**U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary  
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director**



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## INTRODUCTION

The Center for Building Technology (CBT) supports the view of the National Bureau of Standards (NBS) that domestic scientific research should be coordinated with the expertise of the world community in order to reach desired objectives. The problem of providing man with shelter is one faced throughout the world. Although each country has difficulties peculiar to itself, there exist large areas of common interest. These areas should be discovered, discussed and divided among interested nations in such a way that solutions can be found efficiently and without duplication of effort.

Individual professional ties among staff members in international building organizations form the base of such cooperative efforts. On a second level, various institutions agree to exchange published research information on a regular basis. Eventually it may be desirable to establish formal cooperative or complementary programs in which the roles of the participants are clearly defined. At this point division of labor becomes feasible. These three approaches to international cooperation are all vitally important to the Center for Building Technology and are arrangements it would eagerly discuss with other nations.

This is the second issue of an annual publication intended to provide CBT management and foreign research organizations with a summary of CBT international activities. Background material on activities which originated in previous years can be obtained from the 1972 report (NBSIR 74-432). Should copies of that or any other referenced publication be desired, please contact the author of this report.

Prior to the publication of this report, two important changes took place in CBT. First, the Building Fires and Safety Section, headed by Mr. I. A. BENJAMIN, was transferred from CBT to the Fire Technology Division on October 1, 1973, and renamed the Program for Fire Control-Construction. CBT replaced Mr. BENJAMIN's section with a Building Safety Section. Second, Dr. J. R. WRIGHT was appointed Deputy Director of the Institute for Applied Technology (of which CBT is a part) on February 24, 1974, at which time he relinquished his position as CBT Director. The following June, Dr. R. N. WRIGHT, who had been Deputy Director/Technical, CBT, was named Director of the Center. For the sake of continuity, however, the persons involved in these changes will be treated in this report according to their pre-October 1973 status.

## FORMAL COOPERATIVE PROGRAMS

### US/FRANCE COOPERATIVE PROGRAM

Centre Scientifique et Technique du Batiment (CSTB)  
4 Avenue du Recteur Poincare  
75782 Paris CEDEX 16  
FRANCE

In a joint statement issued on November 25, 1969, by Mr. F. X. ORTOLI, Minister of Industrial Development and Scientific Research, and Dr. L. DU BRIDGE, White House Science Advisor, cooperation between France and the United States in several scientific fields, including building technology, was initiated. Formal letters of agreement were then exchanged by Mr. G. BLACHERE, Director of the Scientific and Technical Building Center (CSTB) in Paris, and Dr. L. M. BRANSCOMB, then Director of the National Bureau of Standards, for the establishment of a cooperative program between CSTB and the Center for Building Technology (CBT). Since that time the two organizations have had an active interchange of research personnel and information as well as periodic study team visits.

On June 15, 1973, Dr. J. R. WRIGHT, Director of CBT, met with Mr. G. HIERHOLTZ, Chief of International Affairs, CSTB, in Washington to discuss the cooperative program. The following October 1, Dr. WRIGHT discussed in detail the progress of the various projects with Mr. BLACHERE in Paris. 1973 activity with respect to these projects is outlined below.

#### Environmental Engineering

This is the most developed of the CSTB/CBT cooperative projects. During 1973 the following subjects were discussed:

1. Correlation of computer calculation studies made by CSTB (analog) and CBT (digital). An important aspect of this project is the computation of heating design and natural air conditioning limits based on building thermal mass. The results, to be released soon in two reports, would help reduce energy consumption. Other facets of this project include the exchange of thermal modeling information.
2. Climatological data. CSTB has developed an instrument to measure the long wave heat loss of a building to the sky. Several of the instruments are being built in France. CBT has ordered one which should be delivered in 1974.
3. Room air distribution and convection. CBT wrote a report on this subject for the US Office of Civil Defense and also produced a five minute film on the study. Both of these are being sent to CSTB.

4. Ventilation of dwellings; humidification of supply air. CSTB has supplied CBT with information on ventilation used in French low cost housing. Information exchange continues on other aspects of the subject.
5. Overall design of a prototype apartment building heated by electricity. CSTB is acting as the architectural-engineering firm in the design of an all-electric apartment building. The goal of the project is to increase significantly thermal comfort while raising energy consumption costs not more than 20%. This would be done using building thermal mass. (The first building should be completed in two to three years.) CBT would like to evaluate the building against the "Guide Criteria for the Design and Evaluation of Operation Breakthrough Housing Systems".
6. Heat pumps. Based on information collected in the US, CSTB has made a feasibility study of the use of heat pumps in France. The draft report was given to CBT in July 1973 for review. CSTB and CBT may begin a joint project concerning the use of heat pumps in the prototype building discussed above.
7. Solar energy. CSTB provided CBT with the proceedings of an international meeting, "The Sun in the Service of Mankind", held in Paris in July 1973. In turn, CBT sent CSTB descriptions of various solar houses that have been built around the world. In 1974 CSTB will make a study of solar energy in France and in particular, a comparison of the performance of solar houses against conventional houses.
8. Energy conservation. In July 1973, CBT gave CSTB its finished report "Technical Options for Energy Conservation in Buildings" (NBS Technical Note 789) of which CSTB made a thorough review. During July CSTB received an American group making a survey of energy conservation in Europe. Among the members were two officials of the Institute for Applied Technology, NBS: Drs. BERG and KREIDER.
9. Air cleaning problems. CSTB will make a feasibility study of air cleaning for central air supply systems to be used in French buildings in the coming years. CBT will send reports of its studies to CSTB.
10. Hospital environment. CSTB intends to undertake a study concerning hospitals for the French Health Ministry. One phase of this study is to send an engineer to the US for one year to be trained in the area of hospital environmental engineering. CBT will find suitable organizations to provide this training.
11. Thermal performance of whole buildings. While CSTB is working on the all-electric apartment building, CBT will be studying single family housing. Mutual exchange of data continues.
12. Instrumentation. Techniques used in instrumentation of projects is being shared.

13. Physiology. CSTB and CBT would like to prepare a joint document defining future habitability criteria from the standpoint of sleeping comfort, learning ability and industrial environment. This might be done in cooperation with Professor B. METZ, Director of the Bioclimatic Studies Center in Strasbourg, France.
14. Air leakage of ducts. CSTB will provide CBT with information from the appropriate French organization, Technical Center for Aerological and Thermal Industries (CETIAT).
15. Evaporative air cooling. CBT will study the material developed by CSTB on an inexpensive air conditioning device used in French school buildings. CBT will explore the possibility of adapting this system for use in certain parts of the western United States.
16. ASHRAE activities. CBT will continue to provide CSTB with material concerning the activities of the American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) as well as helping CSTB staff to become members.
17. Electrical distribution problems. CSTB is sending a report it finished in 1973 on electrical heating to CBT. In addition CSTB will forward information from Electricite de France, the national electrical authority, to CBT.
18. Moisture transfer. A study of cold storage warehouse walls is taking place at CBT and information is being exchanged.
19. Smoke and ventilation. A study on this subject is now in progress at CSTB and the results will be sent to CBT.
20. Tightness of double glazed windows. Information on current investigations at CSTB will be sent to CBT.
21. Mechanical vibration and plumbing noise. Information will continue to be exchanged.

During 1973 two exchanges of thermal engineering personnel took place.

Dr. J. HILL, Thermal Engineering Systems Section, CBT, made an intensive study visit to CSTB from July 9 through July 20, 1973. The purpose of this trip was to determine the status of space heating and cooling with solar energy in France, and to continue to exchange information on projects being conducted in both organizations. During his stay Dr. HILL also visited ten other institutions interested in thermal studies including the Solar Energy Laboratory of the National Center of Scientific Research (CNRS) located at Odeillo in the French Pyrenees Mountains. Here during recent years, Professor TROMBE has been conducting studies on the use of solar energy for house heating.

Between October 1 - 12, 1973, Mr. A. REGEF of CSTB visited the United States under a program sponsored by CBT. Ten organizations including NBS were visited in connection with the topics of heat pumps, air motion, and heat recovery.

Plans for 1974 include Messrs. RUBENSTEIN and BOREL of CSTB visiting CBT in the fall on the subject of air cleaning, and the French prototype apartment building respectively; and second, CBT participation with CSTB in the organization of the Second Symposium on Thermal Engineering Calculations by Computers to be held in Paris June 12 - 14, 1974. Mr. P. R. ACHENBACH, Chief Building Environment Division, CBT, and Dr. T. KUSUDA, Thermal Engineering Systems Section, CBT, will take part.

### Durability of Materials

On March 9, 1973, Dr. W. ROSSITER of the Materials and Composites Section, CBT, arrived in France to spend a year in the CSTB laboratories. Dr. ROSSITER'S principal area of investigation is concerned with the thermal cycling of foamed-plastic roofing insulations (particularly polystyrene) to which a bituminous waterproofing membrane has been completely adhered. Dr. ROSSITER has completed the assembly of all necessary equipment and is carrying out his experimental work. Both Mr. BLACHERE and Mr. FARHI (Dr. ROSSITER's immediate supervisor) are quite pleased with the progress he has made. Dr. ROSSITER will return to CBT in June 1974 after completing a draft report on the project intended for joint CSTB/CBT publication.

Dr. G. FROHNSDORFF, Chief of the Materials and Composites Section, CBT, visited CSTB in September 24, 1973. In addition to meeting with Dr. ROSSITER, he was able to get a general overview of the work done at CSTB including materials research, plumbing, and fire studies.

Between October 9 - 19, 1973, Mr. R. COPE of the Grenoble Establishment of CSTB visited the United States on the subject of the use of plastics in building. In addition to CBT, Mr. COPE visited five plastics organizations, and attended an ASTM meeting on adhesives. Mr. COPE was one member of the two-man third Regular French Team, mentioned later in this report.

### Wind Loads on Structures

During 1973 CSTB and CBT wind engineering researchers continued to exchange reports and information on their studies. The CSTB group at the Nantes Establishment is studying wind loads acting on buildings located on hills, where wind loading is stronger than in flat terrain. This is of interest to CBT since no criteria for the wind design of structures located on hills are provided by the American National Standards Institute. CSTB researchers have, on the other hand, expressed an interest in, and have received from CBT information on automated spectral analysis techniques and methods for estimating dynamic alongwind response.

Dr. E. SIMIU, Structures Section, CBT, has been invited to visit the CSTB wind research facility at Nantes in June 1974.

### Fire Research

CSTB is interested in receiving copies of legislation passed by the US Congress on fire research and safety, as well as information on the NBS fire loads project being carried out for the General Services Administration and the Department of Housing and Urban Development. This material will be sent when available.

## Building Acoustics

Mr. J. VIAN, the other member of the third Regular French Team, also from CSTB, Grenoble, studied the subject of noise cancellation during his stay in the United States, October 9 - 25, 1973. A total of ten organizations, including NBS, were visited in order to discuss the type of microphone necessary for the noise cancellation process. In addition, Mr. VIAN attended a convention of noise experts held in Washington. As a result of the visit, CSTB may contract with an American company to provide the necessary microphone system.

CBT developed and finished building a hybrid analog-digital system apparatus designed for data storage and the determination of the slope and maximum amplitude of noise. Mr. D. BLOMQUIST, Applied Acoustics Section (formerly part of CBT), delivered the system to the Grenoble station of CSTB for their use on November 12, 1973. Before returning to NBS on November 16, Mr. BLOMQUIST explained the system to the CSTB staff, and gave instructions on its maintenance. A test of the apparatus was then successfully completed.

## Special Team Visit-Medical Facilities

A reciprocal Special French Team, concerned with health care facilities, visited the US between June 4 - 15, 1973. The group, led by Mr. HIERHOLTZ of CSTB, provided the opportunity for members of the French Government to visit major American medical facilities. Team participants included officials of the Ministry of Public Health, the Central Building Society of the Savings Bank Union (SCIC), and the Central Society for Territorial Facilities (SCET). Following a briefing session at CBT the team began its study tour of these facilities: the Mayo Clinic, the Methodist Hospital, Rochester; Letterman General Hospital, Oak Knoll Hospital, and the Kaiser Foundation Hospital, San Francisco area; the Veterans Administration Hospital, San Diego; Johns Hopkins Medical Center, Columbia, Maryland; Fairfax County Hospital, Virginia; and the National Institute of Health, Bethesda.

A followup trip to Washington was made on October 9, 1973 by Mr. J. BONGRAND, Chief of the Structures and Facilities Service, French Ministry of Public Health. In discussions with Dr. WRIGHT and Mr. S. KRAMER, the CBT leader for this project, Mr. BONGRAND suggested two future visits to the United States by French authorities. The first mission would make a study of hospital construction topics such as nursing unit configurations, communication systems, surgical unit design and building technology; while the second would concern an overview of extended care facilities such as nursing homes.

## Regular Team Visits

As mentioned previously, the third Regular French Team came to CBT in October 1973 (see sections on Durability of Materials and Building Acoustics). The third Regular US Team visit to France, scheduled for June 10 - 21, 1974, will have as its theme "Industrialization Applied to Residential Construction." The team, to be composed of representatives from government agencies and private organizations involved in this subject, will be headed by Dr. E. O. PFRANG, Chief of the Structures, Materials and Life Safety Division, CBT.

## Translations

During 1973 two French articles were translated, and then published in English by CBT. They are: "Ventilation Air Inlets for Dwellings" (NBS Technical Note 710-6), and "Weak Thermal Points or Thermal Bridges" (NBS Technical Note 710-7). Three additional French articles are expected to be published by CBT in 1974.

The distribution of the first seven Technical Note translations has been very successful. Of the 10,040 copies printed, nearly 10,900 (85%) have been requested and disseminated.

There is general agreement between CSTB and CBT that the US/France Cooperative Program in Building Technology is being carried out in a successful manner. It is observed that both organizations obtain direct participation from their respective staffs without difficulty. In addition, CSTB and CBT are effective in incorporating expertise from other government agencies within their two countries. This has been demonstrated in the two special hospital teams. However, the involvement of the academic and industrial community will be stressed in future exchanges of teams and individuals.

Building Research Establishment (BRE)  
Garston, Watford, WD2 7JR  
UNITED KINGDOM

On July 21, 1971, a memorandum of understanding was signed by Mr. P. WALKER, Secretary of State, UK Department of the Environment and Mr. G. ROMNEY, Secretary of the US Department of Housing and Urban Development. It outlines a program for cooperation in matters concerning urban environment including housing and building technology. The Building Research Establishment (BRE) and the Center for Building Technology (CBT), have long been acquainted with each other's work and have had a great deal of interaction. With the signing of the memorandum of understanding, impetus was given to establishing formal cooperation between the two groups under the title of the "Joint Complementary Research Program". Three proposals were drawn up for implementation in 1972. They are: Wind Loads on Buildings, Design of Water Supply and Drainage Installations in Buildings, and Fire Detection in Buildings.

During 1973, Dr. J. R. WRIGHT, Director of CBT, visited BRE in April, and the following month, Mr. P. BAKKE, Assistant Director of BRE visited the Center, both to examine the progress of the three projects.

### Wind Loads on Buildings

The principal accomplishment under this project in 1973 was the installation of the NBS Electro-Optical Deflection System in the Post Office Tower in London. The tower is 671 feet high and has a variable diameter. The tower is circular in cross-section and has an outside diameter of 50 feet over most of its height. The tower core tapers from 30 to 20 feet (inside diameter) and wall thickness varies from 21 to 12 inches over the height for which relative deflections are being measured. The tracking telescope was installed in the cable shaft on the fifth floor and the light source was installed at the level of the middle aerial gallery, approximately 340 feet above the telescope. The system calibration was based on displacements of plus or minus two inches at 300 feet. Recording is under manual control using a 14 channel analog tape unit. In addition to deflection in two directions, wind speed and direction at the top of the tower and accelerations at various levels will also be recorded. It is recognized that rotation of the telescope support may be significant and measurements of tilt at the level of the fifth floor will be attempted using electro-levels which are currently available at BRE.

In June and September 1973, Dr. R. A. CRIST (Chief, Structures Section, CBT) and Dr. N. F. SOMES (Technical Assistant, Structures, Materials and Life Safety Division, CBT) respectively visited BRE for preliminary discussions on the Post Office projects as well as other topics. Between December 12, and 19, 1973, Dr. R. D. MARSHALL, Structures Section, who is the CBT monitor for the project, participated in the installation of the Deflection System in London.

CBT is in the process of modifying the system and making certain operational revisions. This is being done by operating a duplicate system in a controlled environment at CBT and coordinating this with the electro-optical system set up in London. Mr. P. SPARKS, BRE, is investigating instrument systems and methods of measuring tilt at the position of the electro-optical telescope. This measurement is important in the overall interpretation of the deflection measurements.

Other exchanges include an ambient pressure probe developed by CBT and being used by BRE in full-scale studies at the Aylesbury wind research site. Discussions also included instrumentation and measurement techniques, wind environment around buildings thermal effects of wind, and the construction of the new wind tunnel facility at BRE.

Arrangements are being made for Mr. J. MAYNE of BRE to visit Dr. MARSHALL during the first week of July 1974. Mr. MAYNE will review various aspects of the wind load research programs and discuss instrumentation and data analysis techniques during this visit. Consideration is being given by BRE to adopt some of the pressure measuring devices being used at CBT.

#### Design of Water Supply and Drainage Installations in Buildings

Until recently it has not been possible to predict accurately the performance of unusual or innovative gravity drainage systems. In a series of studies over the last two decades, researchers at the Building Research Establishment (BRE) have developed a simple procedure and computer program that it recommends for this purpose. Researchers at BRE are interested in obtaining further field data on comparison with predictions obtained using their program. The Center for Building Technology (CBT) researchers are interested in the potential for application of this approach to US plumbing system designs which differ significantly from those used in the United Kingdom. The central thrust of the initial project on hydraulic design of drainage systems is to test and compare results on alternative approaches to predicting the performance of drain-waste-vent (DWV) systems.

During the year BRE sent CBT an early version of the relevant pipe-sizing computer program and related instructions, a paper describing the BRE procedure for making pressure drop tests for fittings, and papers describing recent BRE developments in measuring pressures and pressure distributions within drainage stacks. The purpose of the paper was to familiarize CBT personnel with the procedures involved in computational prediction of performance by the BRE method.

CBT supplied BRE with detailed drawings and descriptions of two sanitary DWV systems with reduced-size dry vents, tested in a CBT program sponsored by Tri-Services (Departments of the Army, Navy and Air Force). One of these was a two-story single-family townhouse system and the other a ten-story, 20-bathroom system such as commonly installed in apartment buildings. The vents were sized by semi-empirical criteria under development by CBT. In addition, CBT sent the designs for three different types of ten-story, 20-bathroom DWV systems utilized in a testing program sponsored by the

Department of Housing and Urban Development (HUD). One system represented a typical American design acceptable to most codes; another an innovative, "single-stack" system designed to the standards of the Copper Development Association; and the third a non-proprietary single-stack design based broadly on criteria presented in BRE publications but modified to accommodate American fittings and architectural constraints. Documentation of installation detail, test methods, and findings in both the Tri-Service and HUD programs is also being transmitted to BRE for their use in comparing it with computed performance based on the BRE computer program.

In September-October, 1973, Dr. J. E. SNELL (Assistant Chief, Building Environment Division, CBT) and Mr. R. S. WYLY (Building Service Systems Section, CBT) visited BRE to review the status of the project and to discuss future directions.

### Fire Detection in Buildings

The National Bureau of Standards (NBS) and the Building Research Establishment (BRE) have similar programs leading toward the development of performance standards and acceptance criteria for automatic smoke detection devices and systems. The emphasis at NBS is on self-contained, residential smoke detectors, while BRE emphasis is on commercial establishment applications.

During 1973, BRE supplied NBS with a draft copy of the proposed European standard on smoke detectors. NBS, in turn, sent copies of technical memoranda relating to its smoke detection work to BRE.

Arrangements have been made to procure from BRE one or more instrumentation packages suitable for monitoring environmental conditions in various occupancies. Based on data available at BRE, fire detectors experience about ten false alarms for every real fire. A quarter of these are believed due to environmental conditions at the detector head. The optimum detector operating conditions can only be reached if more is known about the environmental factors which may cause false alarms. To this end, BRE has under development instrumentation packages suitable for monitoring background environmental conditions of the kind responsible for causing false alarms. Problems have been encountered in finalizing the instrumentation. When these have been solved, NBS will be receiving the equipment and will work with BRE in developing the necessary data.

On October 1, 1973, the Building Fires and Safety Section was transferred from CBT, and became the Program for Fire Control-Construction as part of the Fire Technology Division, IAT, NBS.

Mr. I. A. BENJAMIN, presently the Acting Chief of the Fire Technology Division, visited BRE in February and October 1973, in order to discuss the joint program, and to become familiar with acceptance test standards for fire detectors in the UK.

US/Japan Panel on Wind and Seismic Effects  
Secretariat  
Public Works Research Institute  
Ministry of Construction  
2-28-32 Honkomagome, Bunkyo-ku  
Tokyo  
JAPAN

The United States/Japan Cooperative Program in Natural Resources (UJNR), established in 1964, includes a wide variety of topic groups including a special Panel on Wind and Seismic Effects. The Japan Panel is composed of sixteen members with Mr. M. NAGAO, Director of the Public Works Research Institute, as its Chairman. The US Panel consists of eight members and has as its Chairman Dr. E. O. PFRANG, Chief of the Structures, Materials and Life Safety Division, CBT.

Dr. PFRANG attended the Fifth US/Japan Panel Meeting held in Japan from May 11 to May 22, 1973. The meeting included a three day technical session (May 14-16) in Tokyo, and field trips to various research laboratories and construction sites during the remainder of the time.

The general themes of the technical sessions were:

1. Comparison of wind tunnel test results with those of prototypes and design wind speed and its influencing factors
2. Seismicity and technological characteristics of seismic ground motion.
3. Earthquake resistibility of structures and methods of rehabilitation.
4. Earthquake resistant design codes.

Topics discussed included: properties of high wind caused by topography and buildings, zoning the San Francisco Bay region on the basis of relative ground motion predictions, seismicity and tectonics in the Andean regions, seismic risk estimation in the US, characteristics of strong earthquake motions observed in Japan, wood structure performance in the 1967 Anchorage Earthquake, proposed criteria for evaluating earthquake resistance of existing reinforced concrete building structures, determination of earthquake hazards in densely populated areas and preventive measures to be considered in urban planning, and a report of the Managua, Nicaragua Earthquake.

At the conclusion of the meeting, the following themes for future activities were drawn up:

1. Characterization of wind relating to structural design considerations.
2. Investigation of the aerodynamic mechanism of wind-structure interaction.

3. Deformability and dynamic characteristics of soils and structural materials.
4. Deterministic methodologies for resisting capacities of existing structures against wind and earthquake. Development of (a) retrofit techniques to increase structural life expectancy and (b) repair techniques for damaged structures.
5. Development of low-cost buildings having sufficient resistibility against wind and earthquake effects.
6. System development for disaster mitigation in urban and priority areas.
7. Assessment of risk on a probability basis to include both loading and response of structures.
8. Increased technological assistance to developing nations.

The Sixth Joint Meeting will be held in the United States at the National Bureau of Standards in May 1974.

## PROPOSED US/SWITZERLAND COOPERATIVE PROGRAM

Forschungskomission Wohnungsbau (FKW)  
Effingerstrasse 20  
3003 Bern  
SWITZERLAND

During 1973, the in-depth report prepared by Mr. H. R. TRECHSEL, Center for Building Technology (CBT), on his November-December 1972 visit to Swiss building organizations, was released as an official National Bureau of Standards publication. NBSIR 73-288 is entitled "Swiss Building and Housing Research Activities".

Following up earlier contacts of CBT management with representatives of Swiss building research organizations, the author visited Switzerland in the fall of 1972 for two weeks.

This report discusses the results of meetings with representatives of the Swiss Federal Commission for Housing Research (FKW), major educational and research establishments, architects, contractors, builders, and local building officials. Topics covered in the discussions included building economics, modular coordination, pre-evaluation of performance of housing projects, pre-evaluation of research projects, building design, land use and planning, transportation, and building laws, codes and standards.

It appears that cooperative programs in any or all of these areas could be profitable to CBT, and to the corresponding Swiss organizations.

Copies of this report were distributed to the appropriate Swiss building authorities as well as US State Department and NBS personnel. Information on obtaining this publication can be provided by the CBT Coordinator of International Affairs.

The reciprocal visit of Professor J. W. HUBER, Director of Federal Construction and President of the Federal Commission for Housing Research (FKW), to the United States has been delayed until next year.

Dr. G. A. GRIN, Scientific Counselor at the Swiss Embassy in Washington, who was responsible for initiating discussions on the cooperative program, will be leaving Washington in early 1974 to fill a post in Switzerland. He wishes to continue to encourage the program from that position. Dr. GRIN will be replaced by Dr. C. FAVRE at the Embassy.

## EXCHANGE PROGRAMS

In addition to the cooperative programs outlined above, the Center for Building Technology (CBT) maintains very close ties with the following parallel organizations through exchange of information and, when appropriate, exchange of professional visits.

Division of Building Research  
CSIRO  
P. O. Box 56  
Highett, Victoria 3190  
AUSTRALIA

During 1973, three staff members of the Division of Building Research visited CBT on the subjects of energy conservation, performance specifications, and the use of ceramic building materials.

Division of Building Research  
National Research Council of Canada  
Montreal Road  
Ottawa K1A 0R6  
CANADA

The Division of Building Research (DBR) and CBT have long been acquainted with each other's technical work. Discussions are now underway for the implementation of a complementary research program, similar to the one in the UK, between the two groups. Initial plans call for the exchange of exploratory visits in order to determine profitable areas of interaction.

Danish Building Research Institute  
Postboks 119  
DK-2970 Horsholm  
DENMARK

Building and Road Research Institute  
CSIR  
University P. O. Box 40  
Kumasi  
GHANA

Central Building Research Institute  
CSIR  
Roorkee (U.P.)  
INDIA

Mr. W. C. CULLEN, Assistant Chief, Structures, Materials and Life Safety Division, CBT, represented the United States at the Silver Jubilee Celebration of the Central Building Research Institute (CBRI), February 26-28, 1973, in Roorkee, India. He presented a paper entitled "Housing Research at the National Bureau of Standards", which was written for the event by Dr. J. R. WRIGHT, Director of CBT, and Mr. W. R. HERRON, former Coordinator of International Affairs. During his stay, Mr. CULLEN met with Professor D. MOHAN, Director of CBRI, on the possibility of establishing an informal cooperative project. It was agreed first to exchange proposals in the area of plastic pipe and then evaluate the potential of such a cooperative arrangement.

Building Research Institute  
Ministry of Construction  
4-Chome, Hyakunin-Cho, Shinjuku-ku  
Tokyo  
JAPAN

Dr. E. O PFRANG, Chief, Structures, Materials and Life Safety Division, CBT, met with Dr. Y. KOIZUMI, Director of the Building Research Institute, during his attendance at the US/Japan Panel meeting held in Tokyo in May 1973.

Building Research Association of New Zealand  
P. O. Box 9375  
Wellington 1  
NEW ZEALAND

Norwegian Building Research Institute  
P. O. Box 322, Blindern  
Oslo 3  
NORWAY

National Building Research Institute  
CSIR  
P. O. Box 395  
Pretoria  
SOUTH AFRICA

During 1973, six members of the National Building Research Institute (NBRI) staff visited CBT in conjunction with such subjects as paints and coatings, chemical analysis of building materials, advisory services, use of computers in the building industry, air conditioning, flooring and roofing systems, and building fires. In addition, Dr. T. L. WEBB, Director of NBRI, and Dr. J. R. WRIGHT, CBT Director, continued regularly to exchange letters and information on current building topics.

Svensk Byggtjanst  
Box 1403  
S-111 84 Stockholm  
SWEDEN.

## SPECIAL PROJECTS

### THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID) PROGRAM

The Center for Building Technology (CBT) is supporting USAID by helping refine low-cost housing and community building designs and construction techniques to better withstand windstorm and earthquakes in developing countries. CBT provided USAID with engineering support and technical assistance for three projects in 1973.

The first, "Design, Siting and Construction of Low-Cost Housing and Community Buildings to Better Withstand Earthquakes and Windstorms," was concerned with analyzing the potentials of housing technology for mitigating earthquake and windstorm disasters in developing countries. Four representative countries were selected for this study: Peru, Turkey, Iran, and the Philippines. These developing countries favorably represented worldwide geographic areas that suffer frequent devastation from earthquakes and extreme winds. Visits were made to these countries by CBT personnel to collect data both through interviews and on-site observations. Reports from contracted local individuals with established expertise in their country's housing and climatological conditions were reviewed and analyzed by CBT project staff. Information from both personal visits and the indigenous individual reports provided the basis for analysis and recommendations. This project was completed in January 1974 with the publication of BSS 48, "Design, Siting and Construction of Low-Cost Housing and Community Buildings to Better Withstand Earthquakes and Windstorms."

The second project, "Improved Adobe Construction," focused on developing improved seismic-resistant buildings in Peru using oil-stabilized and cane-reinforced adobe block for building construction. This study was performed in collaboration with the Peruvian housing authorities, and educational institutions both in the US and Peru. CBT provided technical support in developing procedures for seismic design and construction of adobe housing units and testing specifications for adobe structural elements. On several occasions representatives from CBT visited Peru to inspect earthquake-affected regions, to coordinate the research and become familiar with Peru's traditional construction and testing practices. The CBT personnel also performed disaster investigations of structural damages inflicted by the 1970 earthquake, and performed an assessment of future experimental needs to develop the basis for seismic design criteria for reinforced adobe dwellings. During an October 1973 trip to Peru, Dr. G. S. FATTAL, Structures Section, CBT, provided the local USAID mission with on-site technical assistance which concluded in a series of letter reports.

In March 1973, a third USAID sponsored project entitled, "Design Criteria and Methodology for Construction of Low-Cost Housing to Resist Typhoons and Hurricanes," was undertaken by CBT.

While wind research has been conducted on tall buildings in developed countries, very little research has been conducted on low-rise buildings, especially in developing countries. The developing countries are at a particular disadvantage since their economy and residents' per capita

income usually do not permit a continued rebuilding of damaged structures after each storm. It is estimated that 85 per cent of some developing country residents live in temporary houses made out of discarded materials. Statistics show that the northern Philippine island of Luzon experiences the highest annual frequency of extreme winds in the world. It is interesting to note that approximately 70 per cent of the Philippine population lives within this area. Post disaster reports indicate that on an annual basis millions of dollars of property are damaged and hundreds of lives are lost due to these typhoons. For example, in 1970, the Philippines experienced four typhoons causing over 1000 deaths and over \$75 million damage to property.

In addition, to the Philippine Islands other worldwide areas experience extreme winds. They include the Indian Ocean countries, the northern Caribbean Islands, and the southeastern United States. With this background in mind, USAID requested assistance from CBT to develop design criteria for low-rise, low-cost structures in developing countries to better withstand extreme winds. Secondly, USAID requested that such assistance be structured to improve the local technical expertise and establish indigenous wind research capability in the participating countries, organizations and institutes.

As a preliminary step to this study, the completed research effort entitled, "The Design, Siting and Construction of Low-Cost Housing and Community Buildings to Better Withstand Earthquakes and Windstorms," described above, clearly pointed out that improvements in the collection and analysis of climatological design data, strength of structural elements, building siting and its geometry, and information regarding structural connection details is needed. Such information gaps are seriously affecting building designs in many developing countries. The results and recommendations of the former study were considered in the planning of the present investigation.

Several developing countries (Philippines, Bangladesh, and Jamaica) were selected by USAID and CBT for participation in this research project. These countries were selected based upon their need for assistance and their potential for implementing and transferring the research results to their respective geographic areas. Three developed countries (Japan, Australia and the United Kingdom) were selected to collect information in research institutes about their experiences with similar projects.

During 1973, Dr. R. D. MARSHALL, Structures Section, and Mr. N. J. RAUFASTE, Office of Federal Building Technology, members of the CBT project team, visited the Philippines in April, September, and November. In addition, the other five countries mentioned above were also visited during the first trip. Progress attained during the first year included: selection of three Philippine test sites, the instrumentation of two test houses, the instrumentation of the University of the Philippines wind tunnel facility, and the formation of a Philippine Advisory Committee. This committee consists of 16 Philippine government agencies, and professional and technical organizations. In addition, CBT participated in an International Workshop in Manila during November 14 - 17, 1973. The workshop focused on assessing the state-of-the-art of low-rise buildings for resisting high

winds. In addition to Philippine and US involvement, delegates from Bangladesh, Jamaica and the United Kingdom made presentations. The workshop resulted in the preparation of thirty-one recommendations which identified courses of action which will lead to program and policy improvements both during the life of the project and after final transfer of technology to the Philippines.

The activities associated with this project will continue through 1975, at which time it is expected that a final design criteria report will be issued.

## SPECIAL FOREIGN CURRENCY PROGRAM

The United States Government acquires foreign currencies in the course of its overseas operations. These and other foreign currencies are kept in Treasure Department accounts and are available to some Government agencies to finance overseas activities. Excess foreign currencies are the US-owned currencies of the countries in which the Treasury Department has found the supply to be greater than required for normal US demands for the next two or three years. Congress makes a separate appropriation to the National Bureau of Standards (NBS) for the purchase of excess foreign currencies in order to carry out scientific research. During 1973 NBS had a Special Foreign Currency Program (SFCP) in India, Israel, Pakistan, Poland, and Yugoslavia. No new grants were made in Israel and Yugoslavia where this Program is now to be replaced by Binational Research Foundations. Some SFCP projects are still continuing on grants previously made. A description of the active SFCP grants, with which the Center for Building Technology (CBT) was involved in 1973, is given below.

Grant 98 - Title: Sanitary Plumbing Drainage for High-Rise Buildings Without Vent Systems

Scope: Investigate performance and economics of sanitary drainage system for high-rise buildings employing unconventional measures such as special fittings or oversized soil and waste stacks intended to maintain acceptable hydraulic and pneumatic performance without the use of conventional system of vent piping.

Principal Investigator: Professor D. MOHAN

Institute: Central Building Research Institute, CSIR, Roorkee, INDIA

CBT Monitor: Mr. R. S. WLY, Building Services Systems Section, CBT

Duration: Three years

Status: Final Approval Pending

Grant 99 - Title: Study of Structural Elements Under Dynamic Loading.

Scope: The research will be directed toward an experimental and theoretical investigation of the effects of blast loads on structural elements and structural models. The experimental study will be directed toward the development of methods of stress and strain measurement in elements under dynamic loading conditions such as those resulting from accidental explosions such as cooking gas. The ultimate aim of the research is to develop criteria which can be used for the performance evaluation of building systems. It is expected that definite recommendations suitable for code implementation will result from the investigation.

Principal Investigator: Professor V. SUNDARARAJAN

Institute: Indian Institute of Technology, Kanpur, INDIA

CBT Monitor: Dr. F. YOKEL, Structures Section, CBT

Signed: July 25, 1970

Expired: January 24, 1974

Status: Time Extension Requested

Grant 100 - Title: Water Conservation Measures in Plumbing

Scope: The aim of this project is to determine performance of sanitary plumbing equipment or systems designed to reduce water consumption through measures such as high-efficiency sanitary fixtures and flow regulating devices. It is intended also to carry out observations and tests on recirculating sanitary waste-disposal systems and on the "Vacuum Sewerage System" in order to ascertain whether efficient oxidation of organic waste products is feasible with small consumption of water.

Principal Investigator: Professor H. ILBERG

Institute: Standards Institution of Israel, Tel Aviv, ISRAEL

CBT Monitor: Mr. R. S. WYLY, Building Services Systems Section, CBT

Signed: March 24, 1970

Expired: March 24, 1974

Status: Awaiting Final Report

Grant 101 - Title: The Reinforcement of Concrete by Polymers

Scope: A new family of materials consists of ordinary concrete impregnated after hardening with a monomer which is then polymerized by radiation. In some cases the results obtained, in terms of mechanical, physical and chemical properties, are very striking. It will be the object of this investigation to study the interaction of the two component materials and to develop an understanding of the mechanism by which the polymer reinforces the concrete as a basis of a more rational design of the composite system.

Principal Investigator: Professor J. GLUCKLICH

Institute: Israel Institute of Technology, Haifa, ISRAEL

CBT Monitor: Mr. T. REICHARD, Structures Section, CBT

Signed: November 8, 1970

Expired: November 2, 1973

Status: Awaiting Final Report

Grant 121 - Title: Development of Tensile Strength, Tensil Strain, and Stress in Fresh Concrete Exposed to High Evaporation

Scope: Previous studies of the plastic shrinkage of concrete showed that the paramount influence on the relation between the tensile stress and tensile strength on plastic cracking was caused by evaporation of water from the fresh concrete. Studies of length change measurements rehological properties, tensile stress, tensile strength, and rate of evaporation of varied mixes exposed to different climatic conditions will be conducted for a period of ten hours after casting. It is hoped that the findings will lead to improved recommendations for concrete design in hot dry weather.

Principal Investigator: Professor R. SHALON

Institute: Israel Institute of Technology, Haifa, ISRAEL

CBT Monitor: Mr. T. REICHARD, Structures Section, CBT

Signed: August 12, 1970

Expired: October 1, 1973

Status: Final Report Received

Grant 143 - Title: Prediction of the Thermal Behavior of Full-Scale Buildings

Scope: To compare and validate several mathematical methods for the prediction of the thermal behavior of buildings, i.e., the pattern of their indoor air temperatures as a function of their design, their construction and of the variations in the outdoor climatic conditions. The Response Factor according to the ASHRAE procedure and the total thermal time constant methods, will receive particular analysis.

Principal Investigator: Dr. B. GIVONI

Institute: Israel Institute of Technology, Haifa, ISRAEL

CBT Monitor: Dr. T. KUSUDA, Thermal Engineering Systems Section, CBT

Signed: July 16, 1971

Expired: July 15, 1973

Status: Final Report Received

## PROPOSED BRAZIL PROJECT

On April 5, 1973, Dr. P. DA SILVA, Assistant to the Director of the Institute of Research Technology (IPT), Sao Paulo, Brazil, visited the Center for Building Technology (CBT) in order to get a general overview of its work and laboratory capabilities. Dr. DA SILVA was interested in the possibility of establishing a technical assistance contract whereby IPT personnel would be sent to CBT for specific training assignments.

Later that year, Dr. R. A. CRIST, Chief, Structures Section, CBT, joined an interdisciplinary NBS study team that visited IPT between September 24-27, 1973. Dr. CRIST met with Dr. A. P. DE CASTRO, Director of IPT as well as Dr. DA SILVA. Following preliminary discussions, Dr. CRIST visited various technical sections including structural research, applied mathematics, soil mechanics, building environment, materials research, and chemical testing. As a result of the trip two proposals were developed as possible building technology projects.

The first project entitled "Housing Technology" would consist of a six month training period for an IPT architect in the area of housing construction. The architect would spend four months at CBT and two additional months at other federal agencies concerning with housing. The result would be a report on the correlation of US housing experience and Brazilian programs, which would contribute to the implementation of improved housing production in Brazil.

The second project, "Orientation in Structural and Building Technology", would be a one month program to train an upper-level IPT engineer in the state-of-the-art of building technology at CBT in relation to structural engineering, building standards and codes, and performance criteria. The resulting report would relate the orientation program at CBT to the objectives of IPT in the areas of structures, and structural codes and standards.

At the close of 1973, IPT and CBT were developing the contractual framework for this project.

## INTERNATIONAL ORGANIZATION MEMBERSHIPS

### CIB ACTIVITIES

Conseil International du Batiment pour la Recherche l'Etude et la Documentation (CIB)  
Postbus 229, Weena 700  
Rotterdam  
NETHERLANDS

The International Council for Building Research, Studies, and Documentation (CIB) was established in 1953 in response to recommendations made by the United Nations Economic Commission for Europe. CIB's major objective is to encourage and stimulate international cooperation in the gathering, refinement, and dissemination of building research information. These mutual exchanges facilitate the development and adoption of building standardization practices which in turn provide for the effective sharing of building research data and interchangeability of products on the international level. Forty-five countries are currently members of CIB and send delegates from building-oriented organizations to participate in various CIB activities. Each full member country appoints a representative to the CIB General Assembly which meets at least once every three years and in which the authority of CIB is vested. The US National Committee for CIB is the sole representative of US interests.

The following CIB committees were represented by Center for Building Technology (CBT) staff members during 1973.

#### W-23A: Safety of Load-Bearing Walls

Development of scientific bases for building codes, especially regarding calculations and testing of stresses in load-bearing walls.

Dr. N. F. SOMES, Technical Assistant, Structures, Materials and Life Safety Division, CBT.

Dr. SOMES attended the annual working meeting in Copenhagen, Denmark, between September 4-7, 1973, as the US Representative. The main topics dealt with behavior of structures with load-bearing walls after local damage, behavior of vertical joints between large panels, and recommendations for design and erection of masonry. At the conclusion of the meeting a document entitled "Reduction of the Probability of Progressive Collapse," developed by the W-23A Committee, was approved for release. Dr. SOMES observed that the problem of building abnormal loading and progressive collapse has received considerably more attention in Europe than in the US and there is a great deal of literature on the subject that would be of use to American building interests.

#### W-24: Dimensional and Modular Coordination (International Modular Group, IMG)

Establishment of rules for dimensional coordination of construction components and products and recommendations for their use.

Mr. C. T. MAHAFFEY, Office of Building Standards and Codes Services, CBT.

## W-40: Heat and Moisture Transfer in Materials and Structures

Study of hygro-thermics, the basic phenomena of moisture and heat transfer in materials and structures.

Mr. F. J. POWELL, Chief, Thermal Engineering Systems Section, CBT.

Mr. POWELL attended the technical sessions of W-40 in Birmingham, England between August 13 and 17, 1973, in his capacity as US Representative. Subjects covered included metric units of heat and moisture parameters, solar insolation on roofs and walls, heat and mass transfers, condensation of water vapor in buildings, use of heat capacity for low cooling loads, gamma-ray attenuation methods of measurement, computerized methods of calculation for low energy use, methods of measurement for drying of building materials and others. The possibility of holding the 1976 Commission meeting in the United States is being discussed.

### S-41: Tall Buildings

Organization of symposia on architecture, construction, engineering, and user's needs in relation to buildings over twenty stories.

Dr. F. Y. YOKEL, Structures Section, CBT.

### W-45: Human Requirements and Building Design

Development of a list of human requirements to aid in drafting unified building codes.

Dr. A. I. RUBIN, Chief, Sensory Environment Section, CBT.

Dr. RUBIN participated in a meeting of the W-45 Committee on September 6 and 7, 1973, in Paris, France. The committee decided to revise and update a listing of human requirement guidelines compiled some years ago. Then, various member countries were asked to study different aspects of the question. The topics include: lighting, windows, noise, human factors, infra-sound, modifiability of space, and anthropometry. The US was assigned the topics of thermal environment, energy conservation, and building design for maintenance.

### S-47: Information Flow in the Building Process

Organization of symposia on the application of theories of information, classification, and coding as guides in the building process.

Mr. J. L. HAECKER, Industrial Liason, CBT.

### W-52: Exchange and Dissemination of Information for Practitioners

Analysis of users' needs and procedures for unifying literature abstracts and applying keywords and thesauri internationally for electronic data processing.

Mr. J. L. HAECKER, Industrial Liason, CBT.

## W-60: Performance Concept in Building

Development of a conceptual framework for a performance approach to building as well as a terminology and a commentary on the existing situation.

Dr. R. WEHRLI, Chief, Architectural Research Section, CBT.

Dr. WEHRLI attended a meeting of the W-60 Committee in Rotterdam, Netherlands, on October 22-23, 1973 and presented a response paper for the Terminology Subcommittee.

## W-62: Water Supply and Drainage in Buildings

Research to develop standards for water supply and drainage facilities in buildings.

Dr. J. E. SNELL, Assistant Chief, Building Environment Division, CBT.

On September 24 and 25, 1973, Dr. SNELL participated in the W-62 Symposium on Drainage Services in Buildings, in Stockholm, Sweden, and presented a paper entitled "A Framework for the Evaluation of Drainage Systems." Other reports on development of research methodology and water conserving fixtures were of particular interest since US concern is just now developing in these areas. It is significant to note that the US appears to stand alone in excessive water use in plumbing fixtures and appliances. On September 26, the W-62 Commission met, with Dr. SNELL as US Representative, and discussed the development of a common language for effective communications between researchers of various nationalities in this field, as well as standard test methods and reference measures. A seminar to be held in the US in spring 1976 is under discussion.

Between February 19-24, 1973, Mr. W. C. CULLEN, Assistant Chief, Structures Materials and Life Safety Division, CBT, attended the 9th meeting of the Program Committee and the 35th meeting of the Board of CIB, in Delhi, India, as the Representative of the US National Committee of CIB.

Mr. R. S. WYLY, Building Service Systems Section, CBT, accompanied Dr. SNELL to the W-62 Symposium on Drainage Services in Buildings held in Stockholm on September 24 and 25, 1973. Mr. WYLY presented a paper, "Studies of Reduced-Size Venting of Sanitary Drainage Systems in the USA", during the proceedings.

## USNCCIB ACTIVITIES

United States National Committee for CIB (USNCCIB)  
National Academy of Sciences  
Washington, DC 20418  
USA

In 1962, under the sponsorship of the National Academy of Sciences, USNCCIB was organized to represent the United States as a full member in CIB. The primary objectives of the USNCCIB are: to function as the liaison between US interests and the CIB and, thus, provide a mechanism through which the ready exchange of building research data generated by US private and public organizations and other CIB members is encouraged; to stimulate, through the establishment of counterpart commissions, the generation of research studies and information on the state-of-the-art in the field of building research and technology; and to motivate organizations to take positive action in furthering building research, studies and documentation.

USNCCIB membership is composed of both participating organizations, private, non-profit, national organizations and federal agencies conducting, sponsoring, administering, or utilizing building related research studies and documentation, and members-at-large, individuals appointed in recognition of their competence in building research and related activities without regard to their organizational affiliations. The Center for Building Technology (CBT) supports the work of the USNCCIB through the National Bureau of Standards, with a grant of \$4,000 a year.

Two CBT staff members played important roles in the USNCCIB structure during 1973. Dr. J. R. WRIGHT, Director of CBT, concluded his third year as Vice-Chairman of USNCCIB, and a member of the Executive Committee. Mr. J. L. HAECKER, Industrial Liason, CBT, continued as the National Bureau of Standards Representative to USNCCIB, and as a member of the Executive Committee.

During 1973, USNCCIB expanded its efforts to develop better methods for information exchange. USNCCIB is now pursuing establishment of the Building Research Information Correlation Service (BRICS) program which involves a long-range plan for integrating and correlating existing building related research resources, relating research programs to user/practitioner needs, and establishing common practice and policy guidance regarding preparation, acquisition, selection, classification, evaluation, accession, and distribution of documented information. The BRICS program ultimately should evolve into a working directory and referral system that will stimulate regular communication between organizations in the national building research community and that will serve as a viable mechanism through which the national network can participate in and benefit from the developing international effort.

As another aspect of its activity to stimulate communication, USNCCIB began publication of "Building Research Notes" (BRN). This bi-monthly newsletter provides interested parties in the building research field with information about current trends in ongoing research, both here and abroad, and about current USNCCIB and CIB activities as well as about symposia and conferences related to USNCCIB interests. To foster direct contact between interested parties, BRN features information regarding ongoing research programs in a concise format that provides a brief description sufficient to enable

individuals to assess their interest and to identify the researcher. The USNCCIB Program Committee met in September 1972, to review CIB Commissions' activities. The Committee classified the CIB Commissions into three priorities. The Program Committee also has recommended the early establishment of a counterpart commission on Noise Protection of Buildings.

The USNCCIB Task Group on Potential New Roles for the USNCCIB, and the CIB, has identified the research area "Feedback of Experience on the Livability of High-Rise Residential Buildings" as one of major continuing importance where little exchange has taken place between the US and international researchers. To provide a manageable scope and common understanding for the search, the subject has been subdivided into three categories: human requirements, service systems, and life cycles. Current planning effort is directed toward the development of appropriate steps required for undertaking the proposed search of existing literature and research projects, and ultimately forming a USNCCIB working group in this area.

The USNCCIB Counterpart Commission on Organization and Management of Construction (OMC), proceeded with its work of correlating United States input to the organization of a CIB Commission on OMC (the first in USNCCIB history to be guided by a coordinator in the United States) and of developing in more detail the tentative work statement for the CIB group. The USNCCIB Counterpart Commission has attempted to formulate a program for OMC within the context of CIB's interest.

Another USNCCIB Task Group, Significant Cost Elements for Community Development, was assembled to explore potential approaches for organizing a program to identify significant cost elements related to community development and to make the impact of those costs more visible. A staff study is exploring potential activities related to selected problems of new community development and livability of new towns that USNCCIB might find appropriate to its objectives and responsibilities.

To provide input from the United States for a CIB Symposium on Box-Unit Construction held in Hungary in April 1973, the USNCCIB jointly sponsored a one-day workshop with the National Association of Building Manufacturers (NABM) on March 7, 1973, in Miami, Florida. Workshop discussion sessions focused on the relationship of the US building code constraints to box-unit construction and the new production process for box-unit construction. The results of the workshop were made available to the CIB Symposium in the form of a summary paper.

Of considerable interest to the USNCCIB during the past year has been the development of participation in the 6th CIB Congress to be held in Budapest, Hungary, in October 1974. Information on the Congress has been distributed to the US building community and organizations that might wish to contribute papers. Subjects to be discussed under the theme of "The Impact of Research on the Built Environment" include: user requirements and the built environment, the impact of research on design, the impact of research on the management process, standards and regulations, the impact of information development on building, and the sponsorship and future development of building research.

A complete description of recent activities can be found in the USNCCIB publication "Activities Report, Fiscal Year 1973", distributed by the National Academy of Sciences.

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J. D'AMELIO, AIA, Vice President, McGraw-Hill Information Service, New York, New York

W. S. DOUGLAS, Senior Partner, Parsons, Brinckerhoff, Quade & Douglas, New York, New York (representing: Building Research Advisory Board)

V. DOWD, Technical Information Specialist, National Technical Information Services, U. S. Department of Commerce, Washington, D. C.

C. M. EASTMAN, Associate Professor, Architecture and Urban Planning, and Director, Institute of Physical Planning, School of Urban and Public Affairs, Carnegie-Mellon University, Pittsburgh, Pennsylvania

\*A. M. FREUDENTHAL, Professor, Engineering and Applied Science, George Washington University, Washington, D. C. (representing: American Society of Civil Engineers)

\*J. L. HAECKER, Industrial Liaison Representative, Center for Building Technology, National Bureau of Standards, Washington, D. C.

L. HALE, Consultant to the Agency for International Development, Arlington, Virginia

J. L. INTERMAGGIO, Professor, Virginia Polytechnic Institute, Reston, Virginia (representing: American Institute of Planners)

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N. H. ROGG, Executive Vice President, National Association of Home Builders, Washington, D. C.

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R. WARD, JR., FAIA, Architect-Research Consultant, Chicago, Illinois

F. WERREN, Research Project Leader, Engineered Wood Projects, Forest Products Laboratory, Madison, Wisconsin

#### Professional Staff

R. M. DILLON, Executive Secretary

S. M. CHARLESWORTH, Technical Secretary

\*Member of the Executive Committee

## ISO ACTIVITIES

International Organization for Standardization (ISO)  
1 Rue de Varembe  
1211 Geneva 20  
SWITZERLAND

In 1946, delegates from twenty-five countries met in London to consider the establishment of a new international organization whose object would be to facilitate the international coordination and unification of industrial standards. Discussions led to the setting up of ISO. ISO is a federation of the national standards institutes of fifty-four countries from all parts of the world. A member of ISO is the national body most representative of standardization in its country, and which has agreed to abide by ISO's Constitution and Rules of Procedure. In the case of the United States, the member organization is the American National Standards Institute (ANSI). The work of developing International Standards is carried out through ISO technical committees, which constitute a forum for the exchange of ideas, with a view to the improvement of quality, increased production, lowering of prices, the expansion of trade and the organization of markets.

Various members of the Center for Building Technology (CBT) staff are involved in ISO technical committees, either through membership in ISO subcommittees and working groups, or by serving in a US liaison function through ANSI.

### TC 35: Paints and Varnishes

Standardization in the field of paints, varnishes and related products, including raw materials and terminology and methods of tests of finished products.

Dr. P. G. CAMPBELL, Materials and Composites Section, CBT.

### TC 50: Lac

Standardization of all forms of lac, namely seedlac, bleached lac, sticklac, Kiri (refuse lac), etc.

Dr. P. G. CAMPBELL, Materials and Composites Section, CBT.

### TC 80: Safety Colors and Signs

Standardization and coordination in the field of safety colors and signs, including test methods for the colors, and in certain cases, the manner in, or device through which, the colors and signs should be displayed.

Mr. K. L. KELLY, Sensory Environment Section, CBT.

Between November 20 and 24, 1973, Mr. KELLY attended the meeting of TC 80 as American Representative. The purpose of the meeting was the editing of ISO Draft Standard, Safety Colors and Safety Signs. Topics

covered included: contrast colors, illuminant conditions, dimensions of safety signs, layout of safety signs, design of symbols, and choice of colors. The committee also decided that ISO/TC 88 (Pictorial Markings for Handling Goods) should be incorporated in TC 80. In conclusion, it was recommended that US participation be substantially increased and it was proposed that TC 80 be invited to the United States in 1975 for their spring meeting.

TC 86: Refrigeration

Standardization in the field of refrigeration, including cryogenics.

Mr. W. J. MULROY, Thermal Engineering Systems Section, CBT.

TC 92: Fire Tests on Building Materials and Structures

Standardization of tests for determining the properties of building materials and structures in relation to protection against fire of the buildings in which they are used.

Mr. I. A. BENJAMIN, Chief (formerly), Building Fires and Safety Section, CBT.

Mr. BENJAMIN attended meetings of Working Groups 2, 4, and 7 (Testing Methods, Reaction to Fire Tests, and Coordination and Correlation of Fire Tests) in Ghent, Belgium, February 19-22, 1973. The three Working Groups reviewed a total of 34 documents during their meetings and prepared a list of items to be presented at the next plenary meeting.

TC 104: Freight Containers

Standardization of freight containers having an external volume of one cubic meter and greater, as regards terminology, classification, dimensions, specifications test methods and markings.

Mr. C. W. PHILLIPS, Thermal Engineering Systems Section, CBT.

TC 108: Mechanical Vibration and Shock

Standardization in the field of mechanical vibration and shock including: terminology; excitation by sources, such as machines, and vibration and shock testing devices; elimination, reduction and control, especially by balancing, isolation, and damping; evaluation of acceptable limits for man, and in machines, vehicles and structures; methods and means of measurement and calibration; and methods of testing.

Dr. R. A. CRIST, Chief, Structures Section, CBT.

Between June 6-7, 1973, Dr. CRIST participated as US Representative in a plenary meeting of Subcommittee 2 (Measurement and Evaluation of Mechanical Vibration and Shock as applied to Machines, Vehicles and Structures) followed by a Working Group 3 (Vibration of Stationary Structures) session. This consisted of a detailed review of acceptable limits of vibration in buildings and structures caused by vehicular traffic, trains, ships, subways, and construction. At the conclusion of the meeting, each country represented was asked to compile available seismic design criteria to assist in the evaluation of damage to structures.

## RILEM ACTIVITIES

Reunion Internationale des Laboratoires d'Essais et de Recherches sur les Materiaux et les Constructions (RILEM)  
12 Rue Brancion  
75737 Paris CEDEX 15  
FRANCE

The International Union of Testing and Research Laboratories for Materials and Structures (RILEM) had its origin in 1947 at a meeting in Paris of a small number of laboratory directors and researchers who were anxious to reestablish the international relations broken off by the war on a new basis. RILEM is an international non-profit association governed by Swiss law. Its purpose is to facilitate contacts and scientific information among its members and its aim is to constitute a medium of exchange and of communication of experience, essentially the experience acquired by the study of materials and building elements, by the observation of works, by tests in the laboratory and in situ, and by research without which none of these activities could progress. The 1973 RILEM membership list shows representatives from seventy-six nations

RILEM fulfills its function of disseminating information and promoting exchange by its publications, its surveys and its symposia. It pursues its undertaking of improvement and unification of testing methods by means of its technical committees. In all, there are approximately twenty-four technical committees covering the spectrum of construction research. Each committee has the task of producing recommendations which will eventually be transmitted to the International Organization for Standardization (ISO), the only body authorized to promulgate international standards.

During 1973, Dr. J. R. WRIGHT, Director of the Center for Building Technology (CBT) continued his membership on the RILEM Bureau which is that organization's executive committee, by virtue of the fact that he was the immediate past President of RILEM (1971-72) until the recent Presidential election in September 1973. He attended meetings of the Bureau in London in April and in Varna, Bulgaria, in September 1973. Dr. WRIGHT maintains his position as RILEM Delegate to the United States.

The second Bureau meeting was followed immediately by a meeting of the Permanent Committee, between September 24-28, 1973, also in Varna. The Permanent Committee is composed of delegates from 40 member countries and is RILEM's top policy and administrative group.

A number of the members of the Permanent Committee showed a great deal of interest in the activities of the ASCE/IABSE (American Society of Civil Engineers/International Association of Bridge and Structural Engineers) Joint Committee on Tall Buildings. This committee was organized several years ago by Professor L. BEEDLE of the Lehigh University with support from the National Science Foundation and held a major international conference on tall buildings at Lehigh in 1972. Although the symposium has been held, Professor BEEDLE and the ASCE/IABSE Joint Committee continue to function, mainly in the form of holding regional symposia in various parts of the world. As RILEM delegate to the US, Dr. WRIGHT was asked to contact Professor BEEDLE and get a complete schedule of future regional meetings, and also to find out how RILEM delegates in the various countries making up the respective regions can participate in the symposia. This information has now been transmitted to RILEM delegates throughout the world.

Another action taken by the Permanent Committee which is of considerable importance to the United States is the authorization of the Second International Symposium to be sponsored jointly by RILEM/CIB/ASTM. The symposium will be held in Finland in the fall of 1977. The subject of the symposium will be the Performance of External Vertical Surfaces of Buildings. Mr. W. C. CULLEN, Assistant Chief, Structures, Materials and Life Safety Division, CBT, Chairman of RILEM Technical Committee 27-EVS, will be outlining the program for the Symposium along with Mr. T. SNECK, RILEM Delegate to Finland. The first symposium sponsored jointly by RILEM/ASTM/CIB was held in Philadelphia in May 1972 on the subject of the Performance Concept in Buildings.

During the Varna meeting three individuals from the United States were admitted to RILEM membership, two as full members and one as an associate member. This brings the US participation in RILEM to a total of 23.

At the conclusion of the proceedings Professor E. GIANGRECO of Italy was elected RILEM President for 1973-74. The next Permanent Committee Meeting will be held in September 1974 in Palermo, Italy.

Dr. G. FROHNSDORFF, Chief, Materials and Composites Section, CBT, was nominated in 1973 for membership in RILEM. He will join the group in 1974.

During 1973, two CBT staff members attended RILEM symposiums as guests. They were Mr. A. HOCKMAN, Materials and Composites Section, who attended a meeting of 25-PEM (Preservation Against the Erosion of Natural Stone Monuments) in Paris, April 11-13. Discussions centered on standardization of laboratory tests that characterize stone and its deterioration, evaluation of preservative processes, and development of accelerated aging techniques. Dr. FROHNSDORFF, mentioned above, attended a symposium on "Pore Structures and the Properties of Materials," sponsored by the RILEM technical committee of the same name (15-PM) and the International Union of Pure and Applied Chemistry, held in Prague, September 17-21. The first half of the meeting was devoted to the characterization of pore systems in materials and the second half to the relationships between the characteristics of pore systems, physical and mechanical properties, and durability of materials.

Also in 1973, RILEM was represented by Mr. CULLEN, CBT, at the CIB Program Committee meeting which was held in Delhi, India, on February 19.

#### US Members of RILEM

##### Delegate

J. R. WRIGHT, Director, Center for Building Technology, National Bureau of Standards, Washington, D. C.

F. J. BALL, Westvaco Corporation, North Charleston, South Carolina

Z. P. BAZANT, Civil Engineering Department, Northwestern University, Evanston, Illinois

R. L. BERGER, Civil Engineering Department, University of Illinois, Urbana, Illinois

University of California, Department of Civil Engineering, Berkeley, California

W. C. CULLEN, Center for Building Technology, National Bureau of Standards,  
Washington, D. C.

A. I. FADL, Civil Engineering Department, University of Illinois, Urbana,  
Illinois

R. D. GAYNOR, National Ready Mixed Concrete Association, National Sand and  
Gravel Association, Silver Spring, Maryland

R. H. HOWE, Pennsylvania Department of Transportation, Harrisburg, Pennsylvania

K. R. LAUER, Civil Engineering Department, University of Notre Dame, Notre  
Dame, Indiana

University of Massachusetts, Civil Engineering Department, Amherst, Massachusetts

R. C. MIELENZ, Vice President, Master Builders, Cleveland, Ohio

R. MUENOW, President, Law Engineering Testing Company, Atlanta, Georgia

H. H. NEWLON, Virginia Highway Research Council, Charlottesville, Virginia

N. M. NEWMARK, Department of Civil Engineering, University of Illinois,  
Urbana, Illinois

E. P. POPOV, University of California, Berkeley, California

S. POPOVICS, Northern Arizona University, Flagstaff, Arizona

R. C. REESE, Consulting Engineer, Toledo, Ohio

C. W. RICHARDS, Civil Engineering Department, Stanford University, Stanford,  
California

R. J. SCHUTZ, Vice President, Sika Chemical Corporation, Lyndhurst, New  
Jersey

H. STAMENKOVIC, Research Engineer, Riverside, California

M. P. WHITE, Head, Civil Engineering Department, University of Massachusetts,  
Amherst, Massachusetts

R. N. WRIGHT, Civil Engineering Department, University of Illinois,  
Urbana, Illinois

## USNCIIR ACTIVITIES

United States National Committee for the International  
Institute of Refrigeration (USNCIIR)  
National Academy of Sciences  
Washington, DC 20418  
USA

The International Institute of Refrigeration (IIR) is an inter-governmental body established in 1920 and governed by an agreement reached in Paris in 1954. The scope of the Institute is all matters relating to the study, production and use of refrigeration in the international field. The IIR is divided in five technical Sections: Cryology; Thermodynamics--Heat and Mass Transfer--Refrigerating Machinery; Biology and Food Science; Storage and Transport; and Air Conditioning. These in turn are divided into working Commissions.

Membership in IIR facilitates keeping up with technical advances in nearly 50 countries, contributing to standardization of nomenclature, participation in the formation of codes and standards, and developing working relationships with scientists and engineers throughout the world.

In 1957, the US National Committee was established to represent the interests of the United States in IIR. The Center for Building Technology (CBT) supports the USNCIIR through the National Bureau of Standards with an annual grant of \$2,000.

During 1973, three staff members of the Building Environment Division, CBT, participated in the work of IIR, as Commission members.

### B-1: Thermodynamics and Transport Processes

Mr. F. J. POWELL, Chief, Thermal Engineering Systems Section,  
CBT.

### D-2: Refrigerated Land Transport

Mr. P. R. ACHENBACH, Chief, Building Environment Division, CBT.  
(Mr. ACHENBACH is a former President of this Commission.)

Mr. C. W. PHILLIPS, Thermal Engineering Systems Section, CBT.

In addition, Mr. ACHENBACH serves as the National Bureau of Standards Representative to USNCIIR and has been named an Honorary Lifetime Member of the IIR.

## CENTER FOR BUILDING TECHNOLOGY GUESTS

### FOREIGN GUEST WORKERS

The National Bureau of Standards (NBS) makes its facilities available for limited periods of time to certain qualified persons other than NBS employees to pursue individual scientific or technical projects under conditions determined by NBS.

The basis for acceptance of a guest worker is an agreement between NBS and the guest worker which includes a work plan. Information or recommendations from outside organizations supporting a request for the acceptance may be submitted by a prospective guest worker, but such organizations are not considered to have any formal connection with the agreement.

As part of its overall interest in international cooperation, the Center for Building Technology (CBT) welcomes Guest Workers in line with general NBS policy. During 1973 the following Foreign Guest Workers had assignments in CBT on the subjects indicated.

(July 5, 1972) - January 19, 1973	Ms. L.W.-Z. LIN Union Industrial Research Institute Hsinchu, Taiwan, CHINA Assigned: Materials and Composites Section, CBT Subject: Thermal Properties of Plastic Pipe
February 1, 1973 - August 17, 1973	Ms. T. CRONBERG Swedish National Building Research Council Stockholm, SWEDEN Assigned: Office of Building Standards and Codes Services, CBT Subject: Building Performance Codes
February 1, 1973 - June 30, 1973 & December 7, 1973 - (March 22, 1974)	Prof. J. KRAZAN Institute for Building Materials and Structures Research Ljubljana, YUGOSLAVIA Assigned: Materials and Composites Section, CBT Subject: Stone Preservation
September 17, 1973 - (June 7, 1974)	Mr. S. H. LOW (United Nations Fellow) Singapore Institute of Standards and Industrial Research, SINGAPORE Assigned: Materials and Composites Section, CBT Subject: Reinforcing Steel Corrosion Prevention

## FOREIGN VISITORS

The Center for Building Technology (CBT) is always pleased to receive guests interested in the building field. Arrangements can be made to visit not only laboratory facilities, but also staff members specializing in particular areas. In this manner professionals of foreign countries and CBT have the opportunity to exchange information and ideas on a completely informal basis. During 1973, the following foreign visits were officially recorded.

January 3, 1973	Dr. F. BUDDE Chief Architect for School Construction Stuttgart, GERMANY Subject: Acoustics, Illumination, Heating, Cooling and Economics in School Buildings
January 8, 1973	Dr. I. A. NAPIER (on contract) Stanford Research Institute Croyden, UNITED KINGDOM Subject: Building Economics
January 10, 1973	Prof. C. DAVIDSON (on contract) University of Montreal Montreal, CANADA Subject: Report on Building Performance
January 19, 1973	Dr. M. DABROWSKI (and 4 team members) Science Advisor Ministry of Construction Warsaw, POLAND Subject: Housing Technology, Building Environment
January 29 - February 1, 1973	Prof. E. BURNETT (on contract) University of Waterloo Waterloo, CANADA Subject: Report on Structural Loading
February 6, 1973	Mr. F. LOUWERS M. H. Lummerzheim and Co. Gent, BELGIUM Subject: Roofing Research
February 12, 1973	Dr. M. DABROWSKI Science Advisor Dr. M. STAwicka Ministry of Construction Warsaw, POLAND Subject: Possible Special Foreign Currency Programs

February 27, 1973	Mr. F. DAHER, Director of Industry Ministry of National Economy Amman, JORDAN Subject: Building Economics
February 27, 1973	Mr. H. SOLTANI, Director General Ministry of Economy Teheran, IRAN Subject: Building Economics
March 5 - 8, 1973	Ms. S. CARRIQUIRIBORDE Instituto Argentino de Racionalizacion de Materiales Buenos Aires, ARGENTINA Subject: Quality Assurance Specifications
March 12, 1973	Mr. E. TAUBER Division of Building Research, CSIRO Highett, AUSTRALIA Subject: Ceramic Building Materials
March 15, 1973	Mr. B. A. KEYS Economic Council of Canada Ottawa, CANADA Subject: Building Economics
March 16, 1973	Dr. H. P. LUHR Building Research Institute Aachen Technical University Aachen, GERMANY Subject: Cement and Concrete
March 19 - 23, 1973	Mr. W. A. ALLEN (on contract) Bickerdike, Allen, Rich and Partners Architectural Consultants London, UNITED KINGDOM Subject: CBT Future Planning
March 23, 26, 1973	Mr. C. LOW National Building Research Institute, CSIR Pretoria, SOUTH AFRICA Subject: Paints and Texture Coatings
March 28, 1973	Dr. S. K. CHOPRA Cement Research Institute of India New Delhi, INDIA Subject: Cement
March 28, 1973	Mr. LIM Kim-Chau Mr. LOKE Kong-Neng Singapore Institute of Standards and Industrial Research SINGAPORE Subject: Building Technology

April 5, 1973

Mr. P. DA SILVA  
Institute of Research Technology  
Sao Paulo, BRAZIL  
Subject: Proposed Technical Assistance  
Program

April 17, 1973

Mr. P. AUDIGIER, Science Counselor  
Mr. J. P. PLUMENSI, Science Attaché  
Embassy of France, Washington  
Subject: Building Technology

April 19, 1973

Mr. A. E. BLAVY (and 4 team members)  
Societe Nationale Industrielle Aerospatiale  
Suresnes, FRANCE  
Subject: Flammability of Aircraft Materials

April 23-24, 1973

Mr. C. BANKVALL  
Lund Institute of Technology  
Lund, SWEDEN  
Subject: Thermal Properties of Materials

May 2-3, 1973

Mr. E. F. G. ROSSOUW  
National Building Research Institute, CSIR  
Pretoria, SOUTH AFRICA  
Subject: Analysis of Building Materials

May 7, 1973

Mr. S. FUJII (and 22 team members)  
Japan Testing Center for Construction  
Materials  
Tokyo, JAPAN  
Subject: Building Technology

May 10-11, 14, 1973

Mr. P. BAKKE, Assistant Director  
Building Research Establishment, DOE  
Garston, UNITED KINGDOM  
Subject: US/UK Complementary Program

May 11, 1973

Prof. G. BRAUER  
University of Freiburg  
Freiburg, GERMANY  
Subject: Building Technology

May 14, 1973

NBS/AID Workshop Team (10 members)  
International  
Subject: Building Standards

May 15, 1973

Mr. J. MARTY  
Mr. A. BONNET  
Saint-Gobain Industries  
Neuilly, FRANCE  
Subject: Roofing, Insulation

May 15-16, 1973

Dr. R. H. LEICESTER  
Division of Building Research, CSIRO  
Highett, AUSTRALIA  
Subject: Structural Reliability

May 16, 1973

Prof. J. MURZEWSKI  
Politechnika Krakowska  
Krakow, POLAND  
Subject: Lecture on "Partial Safety Factors  
Specified According to Operations  
Theory"

May 16, 1973

Mr. J. PASTORE  
Proct - Projecto Ciencia e Technologia  
Sao Paulo, BRAZIL  
Subject: Building Technology

May 29, 1973

Prof. N. CZAIIKA  
Bundesanstalt fur Materialprufung  
Berlin, GERMANY  
Subject: Structural Testing

May 31, 1973

Soviet Science Writers Team (6 members)  
USSR  
Subject: Building Technology

June 4, 1973

Mr. T. JEN  
Union Industrial Research Institute  
Ministry of Economic Affairs  
Hsinchu, Taiwan, CHINA  
Subject: Paint Coatings

June 4, 15, 1973

French Hospital Team (8 members)  
Scientific and Technical Building Center (CSTB)  
Paris, FRANCE  
Subject: Hospital Construction

June 5, 1973

Soviet Exchange Team (3 members)  
Ministry of Construction Machinery  
Moscow, USSR  
Subject: Concrete

June 12, 1973

Dr. C. POPESCU  
Bucharest Municipality  
Bucharest, ROMANIA  
Subject: Use of Computers in Building

June 13, 1973

Mr. C. MAURANDY  
Commission of the European Communities  
FRANCE  
Subject: Materials Testing

June 19, 1973

Mr. J. KUMANOTANI  
Tokyo University  
Tokyo, JAPAN  
Mr. K. NAGASE  
Saito and Company, Ltd.  
Chiba, JAPAN  
Subject: Paint Technology, Polymers



August 20, 1973

Mr. O. GARN  
Akts. Jens Villadsens Fabriker  
Herlev, DENMARK  
Subject: Roofing Research and Marketing

August 22, 1973

Mr. B. W. J. VAN RENSBURG  
National Building Research Institute, CSIR  
Pretoria, SOUTH AFRICA  
Subject: Use of Computers in Building Industry

August 22, 1973

Mr. S. YODAIKEN, Director  
Jerusalem Branch  
Standards Institution of Israel  
Jerusalem, ISRAEL  
Subject: Standards and Testing of Building  
Materials

August 23, 1973

Dr. B. GIVONI  
Building Research Station, Technion  
Haifa, ISRAEL  
Subject: Special Foreign Currency Program

August 31, 1973

Japanese Teachers Team (14 members)  
Board of Education  
Okajama-Ku, JAPAN  
Subject: Building Technology

September 6-7, 1973

Mr. E. R. BALLANTYNE  
Division of Building Research, CSIRO  
Highett, AUSTRALIA  
Subject: Energy Conservation

September 11, 1973

Mr. R. LIVET  
Westinghouse Canada, Ltd.  
Hamilton, CANADA  
Subject: Thermal Engineering

September 11, 1973

Mr. W. WERNER  
Gebr. Sulzer AG  
Winterthur, SWITZERLAND  
Subject: Thermal Engineering

September 12, 1973

Dr. K. BERGHOLM, Director  
Finnish Standardization Institute  
Dr. P. MALINEN  
Ministry of Commerce and Industry  
Helsinki, FINLAND  
Mr. R. HALLAMA, Scientific Attaché  
Embassy of Finland, Washington  
Subject: Building Technology

September 12, 1973

Mr. EVAZZADEH  
Mr. HARIRI  
Mr. SOROUDI  
Institute of Standards and Industrial Research  
of Iran  
Teheran, IRAN  
Subject: Building Technology

September 12-14, 1973	Mr. P. OLIVIER National Building Research Institute, CSIR Pretoria, SOUTH AFRICA Subject: Air Conditioning
September 13, 1973	Mr. F. HADASS, Director Emeritus Standards Institution of Israel Tel Aviv, ISRAEL Subject: Future Cooperative Programs
September 13, 1973	Dr. S. S. SHU, Chairman Dr. T. S. C. WANG National Science Council Taipei, Taiwan, CHINA Mr. H. C. PAN, Science Counselor Embassy of the Republic of China, Washington Subject: Building Technology
September 14, 1973	Mr. M. DELEUZE Mr. M. VAUSSANVIN MMT Pournus, FRANCE Subject: Porcelain Enamel
October 1-2, 12, 1973	Mr. A. REGEF Scientific and Technical Building Center (CSTB) Paris, FRANCE Subject: Heat Pumps, Air Motion
October 4-5, 1973	Dr. P. K. FOSTER N. Z. Pottery and Ceramics Research Association Lower Hutt, NEW ZEALAND Subject: Structural Uses of Ceramics
October 9, 19, 1973	Mr. R. COPE Mr. J. P. VIAN Third Regular French Team Scientific and Technical Building Center (CSTB) Grenoble, FRANCE Subject: Use of Plastics in Building; Noise Cancellation
October 10, 1973	Dr. Y. MINEMATU Shibaura Institute of Technology Tokyo, JAPAN Subject: Weathering of Plastics
October 16, 19, 1973	Prof. L. E. NEVANDER Technical University of Lund Lund, SWEDEN Subject: Performance Concept in Building
October 19, 1973	Mr. E. ACHILLES (and 35 team members) Director, Fire Prevention Department Frankfurt, GERMANY Subject: Fire Protection in High-Rise Buildings



November 29, 1973

Japan Industrial Planning Association Team  
(13 members)  
Tokyo, JAPAN  
Subject: Heat Insulators

December 3, 1973

Dr. C. GUZMAN, Rector  
University of Oruno  
Dr. E. POPPE, Rector  
University of Potosi  
Dr. L. RIVERA, Rector  
University of Chuquisaca  
BOLIVIA  
Subject: Building Technology

December 27, 1973

Mr. M. D. MASON  
Commonwealth Department of Works  
Melbourne, AUSTRALIA  
Subject: Building Technology

## CBT FOREIGN TRAVEL

In order to further develop the Center for Building Technology (CBT) staff, foreign travel is encouraged under certain circumstances. These include such occasions as interaction with overseas research groups involved in cooperative programs, participating in international organization meetings, or simply studying foreign approaches in the field of building technology. In all cases such travel provides the CBT staff an invaluable opportunity to broaden its professional outlook. CBT foreign travel for 1973 is described below.

February 17-  
March 2, 1973

Mr. W. C. CULLEN, Assistant Chief  
Structures, Materials and Life Safety Division,  
CBT  
Location: INDIA  
Purpose: CIB Meeting; Discuss SFCP (PL-480  
Programs); Central Building Research  
Institute Silver Jubilee

February 18-  
March 2, 1973

Mr. I. A. BENJAMIN, Chief (formerly)  
Building Fires and Safety Section, CBT  
Location: BELGIUM; UNITED KINGDOM  
Purpose: ISO Meeting (TC-92); US/UK Com-  
plementary Program; Visit Research  
Laboratories

April 4-6, 1973

Dr. J. R. WRIGHT, Director  
Center for Building Technology  
Location: UNITED KINGDOM  
Purpose: US/UK Complementary Program;  
RILEM Meeting

April 11-19, 1973

Mr. A. HOCKMAN  
Materials and Composites Section, CBT  
Location: FRANCE; UNITED KINGDOM  
Purpose: RILEM Meeting (25-PEM); Visit  
Research Laboratories

April 21-  
May 6, 1973

Dr. R. D. MARSHALL  
Structures Section, CBT  
Location: JAPAN; PHILIPPINES; AUSTRALIA  
Purpose: USAID Project

April 21-  
May 9, 1973

Mr. N. J. RAUFASTE  
Office of Federal Building Technology,  
CBT  
Location: JAPAN; PHILIPPINES; BANGLADESH;  
UNITED KINGDOM  
Purpose: USAID Project

May 9-23, 1973

Dr. E. O. PFRANG, Chief  
Structures, Materials and Life Safety Division, CBT  
Location: JAPAN  
Purpose: US/Japan Panel

May 16-18, 1973	Dr. J. E. HILL Dr. T. KUSUDA Thermal Engineering Systems Section, CBT Location: CANADA Purpose: ASHRAE Meeting
June 4-8, 1973	Dr. R. A. CRIST, Chief Structures Section, CBT Location: UNITED KINGDOM; GERMANY Purpose: US/UK Complementary Program; ISO Meeting (TC-108); Visit Research Laboratories
June 14- July 6, 1973	Dr. G. T. YONEMURA Sensory Environment Section, CBT Location: GERMANY; NETHERLANDS; UNITED KINGDOM Purpose: Various Color and Illumination Meetings; Visit Research Laboratories
June 16-22, 1973	Dr. R. N. WRIGHT, Deputy Director/Technical (formerly) Center for Building Technology Location: GUATEMALA; NICARAGUA Purpose: Managua Reconstruction Seminar
June 25-29, 1973	Dr. C. G. CULVER Office of Federal Building Technology, CBT Location: ITALY Purpose: 5th World Conference on Earthquake Engineering
July 8-11, 1973	Mr. N. J. RAUFASTE Office of Federal Building Technology, CBT Location: JAMAICA Purpose: USAID Project
July 8-22, 1973	Dr. J. E. HILL Thermal Engineering Systems Section, CBT Location: FRANCE Purpose: US/France Cooperative Program
July 9-27, 1973	Dr. R. N. WRIGHT, Deputy Director/Technical (formerly) Center for Building Technology Location: NICARAGUA; MEXICO Purpose: USAID Review of Nicaraguan Building Codes
August 13-17, 1973	Mr. F. J. POWELL, Chief Thermal Engineering Systems Section, CBT Location: UNITED KINGDOM Purpose: CIB Meeting (W-40)

August 28-31, 1973	Dr. S. T. MARGULIS Architectural Research Section, CBT Location: CANADA Purpose: American Psychological Association Convention
August 31- September 14, 1973	Dr. N. F. SOMES, Technical Assistant Structures, Materials and Life Safety Division, CBT Location: UNITED KINGDOM; DENMARK; SWEDEN; FRANCE Purpose: Visit Research Laboratories; CIB Meeting (W-23A)
September 6-21, 1973	Dr. A. I. RUBIN, Chief Sensory Environment Section, CBT Location: FRANCE; DENMARK; SWEDEN; UNITED KINGDOM Purpose: CIB Meeting (W-45); Visit Research Laboratories; 3rd Conference on Psychology and the Built Environ- ment
September 6-24, 1973	Mr. N. J. RAUFASTE Office of Federal Building Technology, CBT Dr. R. D. MARSHALL Structures Section, CBT Location: PHILIPPINES Purpose: USAID Project
September 6-30, 1973	Dr. G. FROHNSDORFF, Chief Materials and Composites Section, CBT Location: CZECHOSLOVAKIA; FRANCE; UNITED KINGDOM Purpose: RILEM Meeting (15-PM); US/France Cooperative Program; Visit Research Laboratories.
September 22- October 4, 1973	Dr. J. E. SNELL, Assistant Chief Building Environment Division, CBT Location: SWEDEN; UNITED KINGDOM Purpose: CIB Meeting (W-62); Visit Research Laboratories; US/UK Complementary Program
September 23-29, 1973	Mr. R. S. WYLY Building Service Systems Section, CBT Location: SWEDEN; UNITED KINGDOM Purpose: CIB Meeting (W-62); Visit Research Laboratories; US/UK Complementary Program

September 24-28, 1973	Dr. R. A. CRIST, Chief Structures Section, CBT Location: BRAZIL Purpose: Potential Cooperative Program
September 24- October 2, 1973	Dr. J. R. WRIGHT, Director Center for Building Technology Location: BULGARIA; FRANCE Purpose: RILEM Meeting; US/France Cooperative Program
October 1-3, 1973	Mr. T. H. BOONE Office of Housing Technology, CBT Location: CANADA Purpose: ASTM Meeting
October 3-5, 1973	Mr. R. D. DIKKERS Office of Building Standards and Codes Services, CBT Location: CANADA Purpose: Building Codes for Industrialized Housing Seminar
October 6-12, 1973 (for varying periods)	Dr. C. G. CULVER Office of Federal Building Technology, CBT Dr. E. O. PFRANG, Chief Dr. N. F. SOMES, Technical Assistant Structures, Materials and Life Safety Division, CBT Dr. R. A. CRIST, Chief Dr. E. V. LEYENDECKER Structures Section, CBT Dr. J. R. CLIFTON Mr. R. G. MATHEY Materials and Composites Section, CBT Location: CANADA Purpose: ACI Meeting
October 14-23, 1973	Mr. I. A. BENJAMIN, Chief (formerly) Building Fires and Safety Section, CBT Location: SWITZERLAND; UNITED KINGDOM Purpose: Various Fire Protection Meetings; US/UK Complementary Program
October 17- November 1, 1973	Dr. G. S. FATTAL Structures Section, CBT Location: PERU Purpose: USAID Project
October 19-28, 1973	Dr. R. WEHRLI, Chief Architectural Research Section, CBT Location: NETHERLANDS Purpose: CIB Meeting (W-60)

November 7-21, 1973

Mr. N. J. RAUFASTE  
Office of Federal Building Technology, CBT  
Dr. E. O. PFRANG, Chief  
Structures, Materials and Life Safety Division,  
CBT  
Location: PHILIPPINES  
Purpose: USAID Project

November 7-  
December 1, 1973

Dr. R. D. MARSHALL  
Structures Section, CBT  
Location: PHILIPPINES  
Purpose: USAID Project

November 12, 1973

Dr. N. F. SOMES, Technical Assistant  
Structures, Materials and Life Safety Division,  
CBT  
Location: CANADA  
Purpose: Present Talk on Performance Concept at  
University of Waterloo

November 12-16, 1973

Mr. D. S. BLOMQUIST (funded by CBT)  
Applied Acoustics Section, Mechanics Division  
Location: FRANCE  
Purpose: US/France Cooperative Program

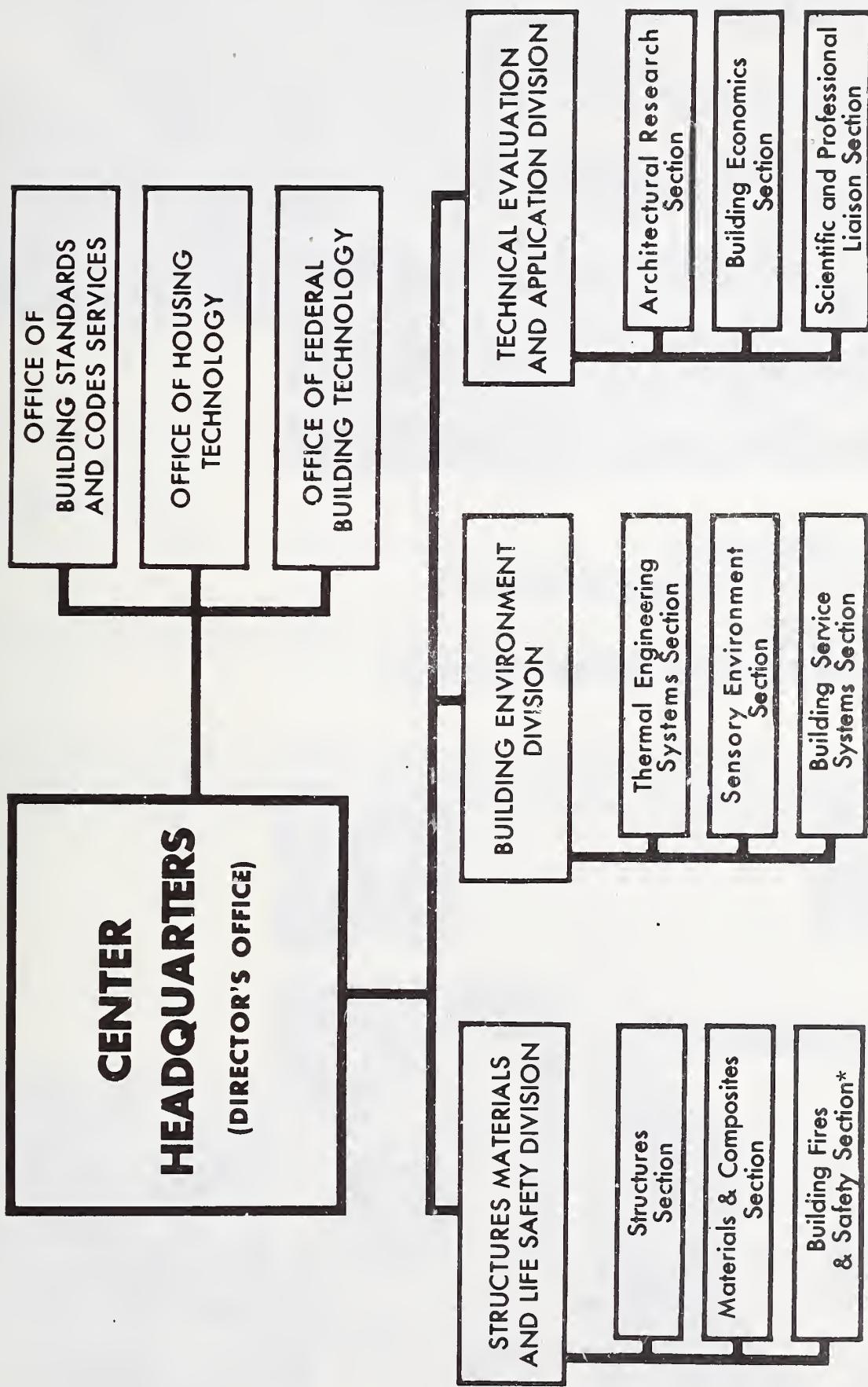
November 20-24, 1973

Mr. K. L. KELLY  
Sensory Environment Section, CBT  
Location: FRANCE  
Purpose: ISO Meeting (TC-80)

December 12-19, 1973

Dr. R. D. MARSHALL  
Structures Section, CBT  
Location: UNITED KINGDOM  
Purpose: US/UK Complementary Program

# CENTER FOR BUILDING TECHNOLOGY



\*As of October 1, 1973, reorganized as the Building Safety Section

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15. SUPPLEMENTARY NOTES		11. Contract/Grant No.		
16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)  This report summarizes the Center for Building Technology's 1973 international activities including formal cooperative programs, exchange programs, special projects, international organization memberships, foreign guests at CBT, and CBT foreign travel.				
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)  Cooperative programs; foreign visitors; information exchange; international building technology; international organization memberships; professional interaction				
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